IH HF Monitoring Septum
Non-Active Facilities
1977 file

September 30, 1977

Dr. Daniel Lillian
Physical & Technological Programs
Div. of Biomedical & Environmental
Research
U. S. Energy Research & Development
Administration
Room E-201
Washington, D. C. 20545

Dear Dan:

TECHNICAL EVALUATION

Enclosed is my evaluation of the Walden proposal which you requested. I hope that it is helpful. The concensus in Oak Ridge is that it would be a valuable contribution to our program. Please note that we do not concur in Walden personnel performing field evaluations in our facilities.

Please let me know if I can be of further assistance.

Sincerely,

James T. Dufour
Occupational Safety & Health Br.
Safety & Environmental Control Div.

OSH:JTD

Enclosure:
As stated

9803.4.3

OFFICE ➤	OS&H Br.					
SURNAME ➤	Dufour/hv					
DATE ➤	9/28/77					

Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1974-526-166

EVALUATION OF RESEARCH PROPOSAL

Development and Demonstration of a Personal Monitoring System Exposure to Hydrogen Fluoride by Walden Division of Abcor, Inc.

1. Need and Importance of Proposed Research

HF is widely used in industry and occupational exposures to it can be expected in a variety of situations. Recent consumption and emerging patterns of use are illustrated by the following table:

Production and Consumption of HF

	1961	1963	1968
HF production: tons/yr[b]	190,000	188,400	280,000
HF utilization[c]			
Fluorinated Organics	40	40	40
Aluminum	33	35	40
Atomic Energy	12	10	-
Petroleum	4	5	20
Stainless Steel	3	3	-
Other	8	7	-

Specific uses of HF include fertilizer manufacture, production of phosphorus and its compounds, aluminum refining, steel manufacturing, and ceramic industry applications. Other significant uses are the manufacture of fluorine compounds, petroleum refining, combustion of coal and in separation of uranium isotopes.

It is in the latter case, of course, where Oak Ridge Operations has had considerable experience in evaluating and controlling occupational exposures to HF. The major process gas in the uranium enrichment industry (both diffusion and centrifuge methods) is uranium hexafluoride (UF_6). While most processes occur in closed systems, occasional intentional or accidental breaches produce UF_6 in quantities ranging from small "puffs" to significant releases. The free UF_6 immediately hydrolyzes in moist air producing UO_2F_2 a white solid precipitant and HF. This is the most common source of exposure in the nuclear industry.[d]

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a) Control Techniques for Fluoride Emmissions, DHEW, 1970 (unpublished draft).

b) Estimated from 1957-1968 Minerals Yearbook, U.S. Dept. of Interior.

c) Kirk-Othmer Encyclopedia of Chemical Technology, Vol. IX, New York, Interscience Publishers 1966, p. 624.

d) Elemental fluorine releases also result in HF exposures through this hydrolysis mechanism. This research could determine the HF Gasbadge's effectiveness as a rough F_2 monitor, as there is no ideal method currently available for this purpose.

The value of the Gasbadge concept is that it permits monitoring of sporadic events without the requirement of elaborate sampling apparatus or even quick response by the facility's industrial hygienist. As use of HF in most applications is closed system, I feel that HF Gasbadge sampler would provide an expeditious if not the sole means of monitoring occasional releases. In other more typically chronic exposure situations, the Gasbadge offers cost advantages as well as better integration of time-weighted-average exposure than is obtained from traditional sampling methods. However, even with the Gasbadge short term peak exposures will need to be extrapolated after the fact -- but this is a problem with all non-instantaneous result methods.

2. Scientific Merit

What is being proposed is an adaptation of existing passive sampling technology to a specific airborne contaminant, HF. The fact that passive collection utilizing the principle of diffusion through a permeable membrane is an efficient and effective method has been demonstrated by the considerable success of previously marketed Gasbadges. Oak Ridge Operations has had some experience with the nitrogen dioxide badge, finding it to be more accurate and precise than Draeger tubes and comparable to conventional impinger sampling with wet chemical analysis. The success of this development project demands no special breakthroughs because pretreated solid collection media are already in use for environmental and work-place sampling. The beauty of the Gasbadge is combining these proven collection media to the simple and inexpensive personal passive sampler. The essence of this development project is quantification of the variables, relative efficiencies of the diffusion pump and collection media: essentially a calibration experiment. While interferences will be tested, we expect few problems because of previous experience with solid collection media for HF.

3. Proposed Personnel and Facilities

In regard to the personnel Walden has assigned to this project and who have authored this proposal, it is clear from the success of other Walden Gasbadges and their personal qualifications that this project is in highly competent hands. The facilities also appear adequate. However, considerable reservations exist regarding the Task 2 field evaluation/demonstration program. Because our facilities are classified, the personnel would need clearances and constant escort. We believe that field evaluation should be conducted solely by Union Carbide Corporation - Nuclear Division personnel at either (or at both) the Oak Ridge Gaseous Diffusion Plant or the Paducah (Kentucky) Gaseous Diffusion Plant. Professional industrial hygiene staff are available at these sites to do evaluation and would remain in close contact with Walden personnel as appropriate. These sites have areas which range from part-per-billion to 10 part-per-million HF on a

continuous basis as well as sporadic episodes of high concentration which would provide adequate test data. We would also expect some saving from the project's estimated cost if in-house evaluation were to be adopted.

In summary, with the exception of the Task 2 field evaluation, I find the Walden Development and Demonstration of a Personal Monitoring System for Exposure to Hydrogen Fluoride proposal quite satisfactory in regards to its need and importance, its scientific merit, and the adequacy of proposed personnel and facilities. In place of Walden personnel, Union Carbide Corporation-Nuclear Division industrial hygiene staff at the test facility(s) should perform the field studies, due to security and administrative considerations. Otherwise, I highly recommend this project.

James T. Dufour
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Occupational Safety & Health Branch
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